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The Mediating Roles of Perceived Stress and Health Behaviors in the Relation between Objective, Subjective, and Neighborhood Socioeconomic Status and Perceived Health

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Abstract

Background—Objective, subjective, and neighborhood socioeconomic status (SES) are associated with perceived health, morbidity, and mortality.

Purpose—We investigated whether perceived stress and health behaviors mediated the relation between the three types of SES and perceived health.

Methods—Participants ($N = 508$) attending a public clinic completed a computerized survey assessing objective SES (income, education, employment); health behaviors; perceived stress; and perceived health. They also indicated their social standing relative to others (subjective SES) and provided their current address to determine neighborhood SES.

Results—In a structural equation model including all three SES types, lower objective and subjective SES were related to poorer perceived health. When mediators were included in the model, there were significant indirect effects of: (a) SES on health through stress; and (b) SES on health through stress and health compromising behaviors.

Conclusions—Interventions to reduce the impact of stressors could improve the health of socioeconomically disadvantaged individuals.

Keywords

socioeconomic status; health behaviors; stress; perceived health

Introduction

Socioeconomic disadvantage is associated with numerous health disparities, including cardiovascular disease, diabetes, cancer, and mortality [1]. The relation between

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socioeconomic status (SES) and health exists at all levels of SES [2, 3], although the relation is stronger for individuals at the lower end of the SES spectrum [4]. Despite advances in medical care and improved health overall, socioeconomic disparities in health have increased over the past several decades [5, 6].

The association between objective measures of individual-level SES (e.g., income, education, occupation) and health has been well-studied [7]. Other measures of SES, including neighborhood SES (e.g., percentage living in poverty, median family income, percentage with a college degree) and subjective SES (i.e., perception of one's SES relative to others) are also related to health. Neighborhood SES is positively correlated with subjective health, physical functioning, and negatively related to early mortality [8–11]. Further, neighborhood SES is associated with various indicators of health (e.g., number and prevalence of chronic conditions, body mass index, self-rated health, early mortality) above and beyond individual- and family-level SES measures [8–15], indicating that neighborhood SES is not merely a proxy for objective SES, but that the neighborhood context affects health above and beyond objective SES. Subjective SES is also related to health outcomes, including physical functioning, perceived health, and susceptibility to the common cold, even after controlling for individual-level, objective measures of SES [16–19].

Thus, research has found that objective SES, neighborhood SES, and subjective SES are all associated with health. However, these three types of SES are correlated [8], making it difficult to disentangle the effects of each type of SES on health. One purpose of the current study is to better understand the unique influence of these different types of SES on perceived health.

Mediators of the Association between SES and Health

Although the relation between SES and health is well-established, why and how these variables are related remains unclear. Numerous explanations for how objective SES leads to poor health have been proposed, including differential access to healthcare, health-related knowledge, stressors, psychological distress, poor health behaviors, hazardous environments, social support availability, and personal resources and coping strategies [1–3, 20–22]. It has been suggested that low neighborhood SES may lead to poor health through violence, low levels of social capital and less supportive social networks, different norms for health behaviors, constraints on physical activity and food availability, limited access to medical care, stressful environmental conditions, and higher levels of pollution and toxins [3, 8, 22–29]. Subjective SES, which may represent a composite of several objective SES variables [16], may lead to poor health through the same mechanisms as objective SES. Alternatively, subjective SES may represent an individual's appraisal of their standing in the social hierarchy; perceived position in the social hierarchy may influence health. Although numerous potential pathways through which SES may lead to poor health have been proposed, little research has tested potential mediators and, to our knowledge, no research has tested mediators of the SES-health relation while simultaneously considering objective, neighborhood, and subjective SES effects on health. Thus, a second purpose of the current study is to test two plausible pathways through which these three types of SES may influence health: (a) stressors and (b) health behaviors.

SES and stressors—Individuals who are socioeconomically disadvantaged experience more stressful life events [30, 31] and, when stressful events do happen, individuals who are socioeconomically disadvantaged perceive these events as more stressful, perhaps due to limited interpersonal and intrapersonal resources to cope with stressors [2]. Neighborhood SES may lead to increased stress through factors such as overcrowding and high crime rates [3, 32]. There is an extensive animal literature that finds associations between being low on the social hierarchy and stress [33, 34], suggesting that subjective SES may also be associated with stress.

Several lines of research support the potential mediating role of stressors in the SES-health relation. First, research on the concept of allostatic load provides evidence of the mediating role of stressors in the SES-health relation. Allostatic load refers to the “wear and tear” on physiologic systems that occurs as a result of these systems adapting to severe or chronically stressful situations [35]. Lower SES is associated with higher allostatic load scores [36, 37]. Higher allostatic load scores are associated with decreased physical functioning, and increased risk of mortality [38–40].

Second, a small body of research provides direct empiric support for the mediating role of stressors in the SES-health relationship. Self-reported stress has been found to mediate the relation between objective SES and health, including physical health symptoms and self-rated health [31, 41]. Further, measures of neighborhood-related stressors (e.g., neighborhood strain, social integration, sense of control, and financial strain) mediated the relation between neighborhood SES and physical functioning [10].

SES and health behaviors—Health compromising behaviors (HCBs) such as smoking, poor diet, and lack of physical activity usually lead to poor health. Low objective SES is associated with higher rates of these health compromising behaviors [2, 42–45]. When health behaviors are assessed longitudinally, health behaviors explain 72% of the association between objective SES and all-cause mortality [42]. Low neighborhood SES [15, 24, 46] and low subjective SES [47] are also associated with HCBs.

Limited research has investigated health behaviors as mediators of the SES-health relation. Health behaviors have been found to mediate the association between objective SES and health [7, 21], as well as the association between neighborhood SES and health [48]. To our knowledge, no research has investigated HCBs as a mediator of the relation between subjective SES and health.

Health compromising behaviors may be used to cope with stressors and to reduce negative affect associated with stressful circumstances [3, 24, 49]. Thus, while health behaviors may mediate the association between SES and health, there may also be a more complex mediational chain in which low SES leads to increased exposure to stressors, which leads to health compromising behaviors to cope with the stressors, which, in turn, leads to poor health. Limited research has investigated such a complex mediation model of the effects of SES on health.

Current Study

In this study, we investigate the relations between objective, subjective, and neighborhood SES; perceived stress; health behaviors; and perceived health (see Figure 1). We hypothesized that all three types of SES would be negatively associated with perceived stress and perceived health, and positively associated with health compromising behaviors. Further, we hypothesized a mediational chain in which low SES leads to greater perceived stress, which leads both directly and indirectly (through increased health compromising behaviors) to poorer perceived health. This is one of the first studies to simultaneously investigate the direct and indirect effects of these three different types of SES on perceived health. In addition, our consideration of HCBs as a potential step on the causal chain from SES to poor health represents an advance over prior research that has frequently viewed health behaviors as an outcome or controlled for the influence of health behaviors on health; because SES may influence HCBs (as a way to cope with the stressors associated with socioeconomic disadvantage), studies that control for health behaviors may underestimate the true impact of SES on health [50]. We employ a structural equation modeling approach to allow for multiple, correlated measures of each type of SES.

Methods

Participants

Participants were patients attending a publicly-funded sexually transmitted disease (STD) clinic who were recruited into a randomized controlled trial (RCT) to evaluate a sexual risk reduction intervention [51]. Inclusion criteria for the trial were: (a) age 16 or older; and (b) engaged in sexual risk behavior (> 1 sex partner or a non-monogamous sex partner in the past 3 months and inconsistent condom use). Exclusion criteria were: (a) severe mental impairment; (b) inpatient substance use treatment; (c) HIV infection; and (d) planning to move out of the area in the next year. Patients were recruited into the trial from August, 2010 through September, 2012. Of the 2766 patients approached, 2677 (97%) agreed to be screened, 1322 (49%) were eligible, and 1010 (76%) consented and completed the baseline survey. Participants were randomly assigned to complete a general-health focused ($n = 508$) or a sexual health focused ($n = 502$) survey. Data for the current study come from the 508 participants who completed the general health survey. Participants were 46% female ($n = 236$), 68% African American ($n = 345$), 18% Caucasian ($n = 92$), and 8% mixed race ($n = 41$). The average age was 28 years ($SD = 9$ years).

Procedures

Patients waiting to be seen at the clinic were called by clinic number and escorted to a private exam room. A trained Research Assistant (RA) obtained verbal consent for screening and screened patients for eligibility. The study was explained to eligible patients; those who were interested in participating provided written, informed consent.

Participants completed a baseline Audio Computer-Assisted Self-Interview (ACASI) in the private exam room. With this technology, questions and response options are read aloud, allowing individuals of all literacy levels to participate while also allowing participants to respond privately to sensitive questions. After completing the ACASI, participants

completed a paper-and-pencil measure of subjective SES. Participants viewed one of two intervention videos as part of the main RCT, and were reimbursed \$30 for their time. All procedures were approved by the Institutional Review Boards of the participating institutions.

Measures

Demographic information—We obtained information on participants' age, sex, and race; dummy variables were created indicating White (vs. Black) and mixed (vs. Black) races.

Socioeconomic status—Measures of income, education, and employment status served as indicators of objective SES. Participants were asked to report their annual yearly family income (<\$15,000; \$15,000 to <\$30,000; \$30,000 to \$45,000; >\$45,000), the highest grade they completed in school (8th grade or less; > 8th grade but < 12th grade; GED; graduated high school; started college; graduated college), and their employment status (employed full or part time; unemployed). These categorical variables served as indicators of a latent objective SES construct.

Neighborhood SES variables were derived from 2010 U.S. Census data. The census tract in which each participant lived was determined from his/her current address. Measures of neighborhood SES included: (a) per capita income in the census tract; (b) percentage of individuals with a college education in the census tract; and (c) percent employed in the census tract. These variables served as indicators of a latent neighborhood SES construct.

Subjective SES was assessed with a paper-and-pencil measure. Participants were shown a ladder with 10 rungs and asked to indicate, with an X, where they fell on the ladder from people who are the worst off in their community (1) to people who are the best off in their community (10) [52].

Perceived stress—Participants completed the 4-item Perceived Stress Scale [53]. This measure assesses perceived stress in the past month (e.g., “How often have you felt you were unable to control the important things in your life?”) on a scale from never (0) to very often (4). This scale has adequate internal consistency and test-retest reliability, and evidence of validity in community samples, as well as among adolescents/young adults and urban populations [53–55]. In the present study, internal consistency reliability was .68. Scale items served as indicators of a latent perceived stress construct [with items 1 and 2 parceled to yield three total indicators; 56].

Health compromising behaviors—We created an index of health compromising behaviors (HCBs), informed by prior research on multiple health compromising behaviors [45, 57, 58], which included substance use behavior, sexual behavior, physical activity, diet, and sleep. Each HCB was dichotomized, and items were summed to form a single index of HCBs, ranging from 0 to 12.

Binge drinking was defined as having had four or more drinks for women (five or more drinks for men) in a single day in the past 3 months [59]. Smoking was defined as ever using

cigarettes or other tobacco products in the past 3 months. Illegal drug use was defined as using marijuana, crack, or cocaine during the past 3 months; in prior research at the clinic, these substances were the only ones used by a substantial percentage of patients [60, 61]. Sexual risk behavior was defined as having sex without a condom with a non-primary partner in the past 3 months. Participants who reported engaging never or rarely in vigorous physical activity (for 20 minutes or more at a time) or moderate physical activity (for 30 minutes or more at a time) in the past 3 months were considered to be physically inactive. Because sitting for > 8 hours/day may compromise health [62], participants who reported sitting for > 8 hours/day were coded as engaging in excessive sitting. Irregular breakfast consumption was defined as eating breakfast on 5 or fewer days during the past week. Participants who reported eating fast food at least once per week were considered to be frequent fast food consumers. Participants who reported consuming both fruits and vegetables less than daily in the past month were coded as infrequent fruit and vegetable consumers. Those who reported drinking soda at least daily in the past month were coded as frequent soda consumers. Those who reported consuming red meat, processed meat, or fried food daily in the past month were coded as having a high-fat diet. Participants who slept fewer than 7 hours or more than 9 hours per night were coded as having poor sleep.

Consistent with prior research [10, 45, 63, 64], we created summed the number of dichotomous indicators of HCBs to form a single indicator of HCB. The index of HCBs ranged from 0 to 12.

Perceived health status—Participants were asked to report their self-rated health with a single item from the Medical Outcomes Study General Health Survey [65]. Participants were asked to rate their health on a 5-point scale from poor (1) to excellent (5). Single items assessing self-rated health are associated with mortality [66].

Data Analysis

The primary study analyses were conducted using structural equation modeling, allowing us to test both direct and indirect associations of objective, neighborhood, and subjective SES with perceived health. Objective SES, neighborhood SES, and perceived stress were represented as latent constructs with three indicators each, while subjective SES, HCBs, and perceived health were represented as manifest variables. Latent constructs were identified by fixing variance at 1 [67]; to increase the interpretability of coefficients, we also standardized the manifest variables in our model.

In our structural model, the three types of SES were allowed to correlate. Directional paths led from all three SES constructs to stress, HCBs, and perceived health; from stress to HCBs and perceived health; and from HCBs to perceived health, in line with our hypotheses. Additionally, directional paths led from demographic variables (including age, male sex, White race, and mixed race) to all constructs in the model in order to control for these variables.

Models were fit with the robust weighted least squares (WLSMV) estimator in Mplus 7 [68]. Model fit was assessed using traditional fit indices, including the comparative fit index [CFI; 69]; the Tucker-Lewis index [TLI; 70]; and the misfit measure known as the root-mean-

square error of approximation [RMSEA; 56]. Good fit is indicated by CFI and TLI values greater than .95 and RMSEA values less than .05 [56, 71].

When testing indirect effects, we utilized bias-corrected bootstrapped 95% confidence intervals based on 5,000 iterations, as is recommended given the non-normal distribution of these effects [72]. We report standardized coefficients and 95% confidence intervals throughout.

Levels of missing data were modest; 8% of participants ($n = 43$) were missing information on neighborhood-level SES, and less than 4% of data was missing for all other variables. Participants with some missing data ($n = 65$) did not significantly differ from those with complete data ($n = 443$) on any key study variables (objective SES, subjective SES, neighborhood SES, perceived stress, health compromising behaviors, or perceived health) or in terms of demographic characteristics (sex, race/ethnicity, and age). (See Asparouhov and Muthen [73] for an explanation of how missing data are handled using the WLSMV estimator.)

Results

Sample Characteristics

The sample was predominantly socioeconomically disadvantaged, with at least half of participants reporting an income <\$15,000/year (53%, $n = 258$), a high school or less education (63%, $n = 322$), and current unemployment (50%, $n = 253$). Participants also lived in socioeconomically disadvantaged neighborhoods, with a median per capita income of \$14,267 per year. The median percentage of college graduates in these census tracts was 13%, and the median employment rate was 89%. Compared to others in their community, participants rated their social status as average ($M = 5.8$ on the 10 point scale, $SD = 1.9$).

Participants reported moderate levels of stress ($M = 1.7$, $SD = 0.8$). They reported, on average, engaging in 6.1 of the 12 possible HCBs. Participants perceived themselves to be in good to very good health, with an average perceived health score of 3.5 ($SD = 1.0$).

Relations among SES Variables

The three SES variables were correlated. Objective SES was correlated with both neighborhood SES ($r = 0.51$, $p < .001$) and subjective SES ($r = 0.27$, $p < .001$). Neighborhood SES and subjective SES were also correlated ($r = 0.11$, $p < .05$).

Relations between SES, Health Compromising Behaviors, Perceived Stress, and Perceived Health

SES and perceived stress—We first explored independent associations between the different forms of SES and perceived stress. Controlling for demographics, objective SES had a significant negative association with stress, $b = -.27$, 95% CI = $[-.42, -.12]$. Subjective SES was also negatively associated with stress, $b = -.34$, 95% CI = $[-.45, -.22]$. Neighborhood SES was not associated with stress (Table 1).

When all three forms of SES were considered simultaneously, both objective SES and subjective SES remained negatively associated with stress, $b = -.25$, 95% CI = $[-.43, -.07]$ and $b = -.32$, 95% CI = $[-.42, -.21]$, respectively. Additionally, after considering objective and subjective SES, neighborhood SES was positively associated with stress, $b = .14$, 95% CI = $[.003, .28]$.

SES and health compromising behaviors—We also explored independent associations between the different forms of SES and HCBs. Controlling for demographics, objective SES was significantly associated with HCBs, $b = -0.13$, 95% CI = $[-0.24, -0.02]$. Subjective SES was also associated with HCBs, $b = -0.17$, 95% CI = $[-0.26, -0.10]$. Neighborhood SES was not associated with HCBs. When all three forms of SES were considered simultaneously, only subjective SES was significantly associated with HCBs, $b = -0.15$, 95% CI = $[-0.24, -0.06]$.

SES and perceived health—We explored independent associations between the different forms of SES and perceived health. Controlling for demographics, objective SES was significantly associated with perceived health, $b = 0.22$, 95% CI = $[0.12, 0.31]$. Subjective SES was also associated with perceived health, $b = 0.25$, 95% CI = $[0.17, 0.34]$. Neighborhood SES was not associated with perceived health. When all three forms of SES were considered simultaneously, both objective and subjective SES remained associated with perceived health, $b = 0.20$, 95% CI = $[0.08, 0.33]$ and $b = 0.20$, 95% CI = $[0.12, 0.28]$, respectively.

Mediation Model

Measurement model—A measurement model containing latent constructs (objective SES, neighborhood SES, and perceived stress); manifest variables (subjective SES, HCBs, and perceived health); and all correlations among constructs fit the data well, $\chi^2(42, N = 508) = 63.64$, $p < .05$, CFI = 0.98, TLI = 0.97, RMSEA = 0.03, allowing us to proceed with our structural model.

Full model—The full model (Figure 1) fit the data well, $\chi^2(76, N = 508) = 102.86$, $p < .05$, CFI = 0.98, TLI = 0.97, RMSEA = 0.03. This model explained 18% of the variance in perceived stress, 9% of the variance in HCBs, and 21% of the variance in perceived health. Although the chi-square test was significant (potentially indicating poor model fit), the chi-square test is not a good indicator of model fit because it is nearly always significant with large sample sizes [56]. For this reason, alternative fit indices such as the CFI, TLI, and RMSEA have been developed. These alternative fit indices all indicate a good model fit.

Direct effects of SES on perceived stress, health compromising behaviors, and perceived health—In the full model, objective SES and subjective SES were both negatively associated with perceived stress, while neighborhood SES was positively associated with perceived stress. Those with higher objective SES and those who perceived themselves as better off reported lower levels of stress, whereas those who lived in higher SES neighborhoods reported higher levels of stress. After accounting for perceived stress, there were no significant direct associations between SES and HCBs. However, even after

accounting for perceived stress and HCBs, objective SES and subjective SES remained directly associated with perceived health; lower objective and subjective SES were associated with perceiving oneself to be in poorer health.

Indirect effects of SES on perceived health through perceived stress—There was an indirect effect of objective SES on perceived health through perceived stress, $b = 0.04$, 95% CI = [0.01, 0.09]. In addition, there was an indirect effect of subjective SES on perceived health through perceived stress, $b = 0.05$, 95% CI = [0.02, 0.10]. Lower objective and subjective SES were associated with greater perceived stress; greater perceived stress, in turn, was associated with poorer perceived health. In contrast, there was a negative indirect effect of neighborhood SES on perceived health through perceived stress, $b = -0.02$, 95% CI = [-0.06, -0.003]; higher neighborhood SES was associated with greater perceived stress, which was in turn associated with poorer perceived health.

Indirect effects of SES on perceived health through health compromising behaviors—There were no indirect effects of SES on perceived health through HCBs.

Indirect effects of SES on perceived health through perceived stress and health compromising behaviors—There was a significant positive indirect effect of objective SES on perceived health through perceived stress and HCBs, $b = 0.01$, 95% CI = [0.002, 0.03], as well as a significant positive indirect effect of subjective SES on perceived health through perceived stress and HCBs, $b = 0.01$, 95% CI = [0.004, 0.02]. Lower objective and subjective SES were associated with greater perceived stress; greater perceived stress, in turn, was associated with more HCBs; more HCBs, in turn, were associated with poorer perceived health. In contrast, there was a significant negative indirect effect of neighborhood SES on perceived health through perceived stress and HCBs, $b = -0.01$, 95% CI = [-0.02, -0.001]. Higher neighborhood SES was associated with greater perceived stress, greater perceived stress was associated with more HCBs, and more HCBs were associated with poorer perceived health.

Total effects of SES on perceived health—The total effect of objective SES on perceived health was significant, $b = 0.21$, 95% CI = [0.07, 0.34], as was the total effect of subjective SES on perceived health, $b = 0.20$, 95% CI = [0.10, 0.30]. The total effect of neighborhood SES on perceived health was not significant, $b = -0.06$, 95% CI = [-0.17, 0.05].

Discussion

Consistent with prior research, we found that objective, neighborhood, and subjective SES variables were correlated [8]. Correlations among the SES variables in our study ranged from $r = .11$ to $.51$. These correlations between SES variables are consistent with findings from other studies [8], and indicate that objective, subjective, and neighborhood SES are distinct constructs. In addition, in the full model both objective and subjective SES were associated directly and indirectly with perceived health, indicating that these variables are tapping different dimensions of socioeconomic disadvantage, each of which are uniquely important in predicting health.

We found support for the hypothesized indirect effects of SES on health through perceived stress, as well as through perceived stress and HCBs. As expected, lower objective and subjective SES were associated with greater stress; greater stress, in turn, was associated with poorer perceived health. Further, we found evidence of an additional indirect path whereby lower objective and subjective SES were associated with greater stress, which was associated with more HCBs, which, in turn, predicted poorer perceived health. This set of findings is consistent with the suggestion that HCBs are used to cope with stressors or to manage negative affect associated with stressors [3, 24, 45, 49]. In addition, stressors may lead to neurologic changes associated with poor self-control and future discounting (i.e., favoring smaller, immediate rewards of engaging in a pleasurable activity over longer-term, larger rewards of good health), which may make it difficult for individuals in stressful circumstances to refrain from engaging in highly reinforcing and pleasurable HCBs [74]. Additional research is needed to better understand the mechanisms through which stressors leads to HCBs. Regardless of the specific mechanism(s), our findings suggest that HCBs should be investigated as part of the pathway from socioeconomic disadvantage to stressors to poor health, rather than treated as a confound.

Both objective SES and subjective SES remained directly associated with perceived health after accounting for the mediating effects of perceived stress and HCBs, and the indirect effects through stress and HCBs were small. This suggests there may be additional pathways—not assessed in the current study—through which SES leads to poor health. Pathways to evaluate in future research include mediators such as healthcare access, social support, coping, social capital, norms, and pollutants and toxins [1, 3, 20, 23]. In addition, the full model explained 21% of the variance in perceived health. There are numerous determinants of *actual* health that were not assessed in the present study, including genetic influences, healthcare access and quality (which may partially be reflected in SES), and early life experiences and behaviors [75]. In addition, *perceived* health may be influenced by personality and mental health factors (e.g., mood, psychiatric disorder), independent of actual health status [76, 77].

In contrast to the expected findings for objective and subjective SES, the effects of neighborhood SES were not consistent with our hypotheses. Neighborhood SES had no direct associations with either HCBs or perceived health and was not independently associated with perceived stress. This contrasts with prior research findings that, even after controlling for other types of SES, neighborhood SES is associated with health [8, 10, 11, 15], including perceived health [9, 12]. After accounting for objective and subjective SES, neighborhood SES was *positively* associated with perceived stress, in contrast to our predictions. However, given the lack of association between neighborhood SES and perceived stress and health when neighborhood SES was considered independently, this unexpected relationship in the full model may be a statistical artifact reflecting that the multivariate analyses assess the relation between perceived health and the portion of the neighborhood SES construct that did not overlap with the objective and subjective SES constructs.

This study had several strengths, including a large sample that allowed for testing multiple mediators and complex meditational paths. In addition, the study had several methodological

strengths, including the use of a computerized survey, which is associated with higher rates of reporting of socially sensitive behaviors relative to other assessment methods [78, 79]. In addition, the use of structural equation modeling allowed for multiple, correlated measures of the objective and neighborhood-level SES variables. SES has multiple components, including income, education, and occupation; constructing latent constructs representing objective and neighborhood SES allowed us to account for this. Use of structural equation modeling also allows for sensitive tests of indirect pathways [80].

This study also had several limitations. The sample was predominantly low-income and lived in low-income neighborhoods; thus, results may not generalize to less socioeconomically disadvantaged populations. However, because the relation between SES and health is strongest at the bottom end of the socioeconomic spectrum [4], it is important to study the pathways through which socioeconomic disadvantage leads to poor health among socioeconomically disadvantaged individuals. In addition, the sample was recruited from an STD clinic. Individuals seeking treatment for STDs may differ from other low income populations in several ways: these individuals are more likely to be engaging in sexual risk behavior (one of the HCBs assessed in the current study); they may be more likely to perceive themselves to be in poor health and to be currently experiencing distress because they believe they are infected with an STD. Thus, results may not generalize to individuals who are not STD clinic patients. The measures relied on patients' *perceptions* of their social standing (i.e., subjective SES), stress, and health. Psychological factors, such as depression, could influence responses on all of these measures, and may account for some of the relations observed in this study. In addition, health behaviors were self-reported; objective measures confirming the accuracy of these self-reported behaviors (e.g., cotinine for smoking, accelerometer or pedometer data for physical activity and sitting) were not collected. Future research should investigate whether there are similar mediational paths between SES and health when using objective measures of health (e.g., body mass index, blood pressure, chronic disease status), rather than perceived health. Finally, this study was cross-sectional; therefore, we cannot be certain about the direction of effects. Although it is possible that poor health may lead to low SES [the social drift hypothesis; 81], data from longitudinal studies suggest that the SES-health association is driven primarily by low SES leading to poor health [the social causation hypothesis; 1, 7], supporting our hypothesized direction of effects.

Interventions aimed at reducing the impact of stressors and improving HCBs could help to improve the health of socioeconomically disadvantaged individuals. Helping socioeconomically disadvantaged individuals to cope with stressors may be a particularly important intervention target, because stress reduction can have both direct and indirect effects on health through reductions in HCBs. For example, mindfulness-based stress reduction has significant benefits for mental health, well-being, and perceived stress [82, 83] and is associated with improved physiologic stress markers [84, 85]. Further, there is emerging evidence that mindfulness techniques may improve health behaviors [86]. Limited research has examined the benefits of these techniques specifically among socioeconomically disadvantaged individuals, but emerging evidence suggests these

techniques may be effective at reducing stress and improving health in low-income populations [87].

In conclusion, when considering only direct effects of SES on perceived health, objective SES and subjective SES, but not neighborhood SES, predicted perceived health. In a mediation model including direct and indirect effects, effects of SES on perceived health were mediated by perceived stress and HCBs. Future research should investigate the effects of stress reduction techniques on the health of socioeconomically disadvantaged individuals.

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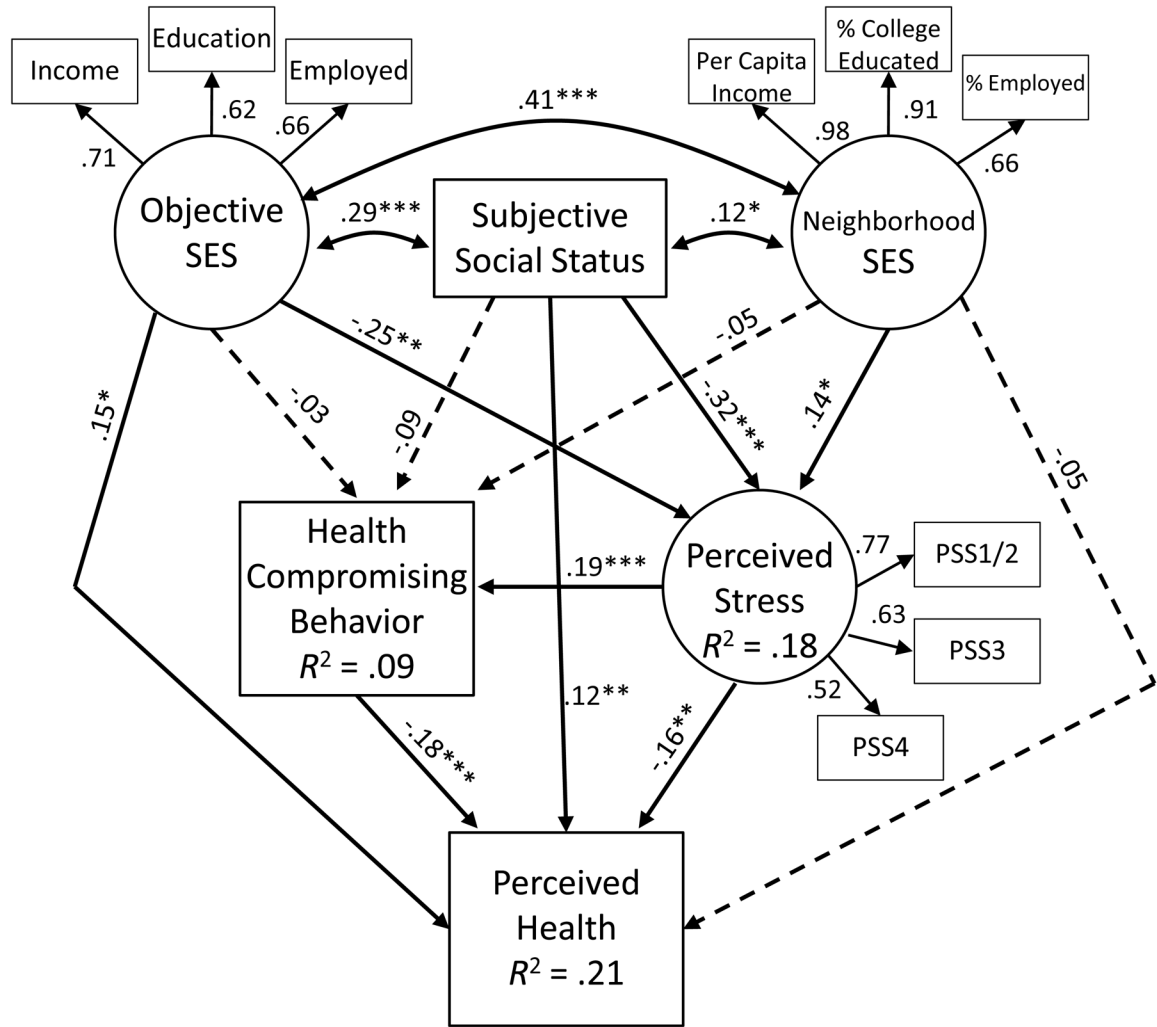
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$\chi^2(76, N=508) = 102.86, p = .02, CFI = .98, TLI = .97, RMSEA = .03, WRMR = .72.$

* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1.

Structural equation model showing associations between SES constructs, perceived stress, health compromising behaviors, and perceived health. Standardized regression coefficients are reported. Control variables included age, sex, and race. Dashed lines represent non-significant paths.

Table 1

Univariate and multivariate associations between SES and perceived stress, health compromising behaviors, and perceived health

	Univariate ^a	Multivariate ^b
Perceived Stress		
Objective SES	-0.27*** [-0.42, -0.12]	-0.25** [-0.43, -0.07]
Neighborhood SES	0.01 [-0.08, 0.11]	0.14* [0.003, 0.28]
Subjective SES	-0.34*** [-0.45, -0.22]	-0.32*** [-0.42, -0.21]
Health Compromising Behaviors		
Objective SES	-0.13* [-0.24, -0.02]	-0.08 [-0.22, 0.05]
Neighborhood SES	-0.07 [-0.17, 0.02]	-0.02 [-0.14, 0.10]
Subjective SES	-0.17*** [-0.26, -0.10]	-0.15** [-0.24, -0.21]
Perceived Health		
Objective SES	0.22*** [0.12, 0.31]	0.20** [0.08, 0.33]
Neighborhood SES	0.06 [-0.02, 0.14]	-0.07 [-0.17, 0.04]
Subjective SES	0.25*** [0.17, 0.34]	0.20*** [0.12, 0.28]

^a Individual associations between socioeconomic status (SES) and stress, HCBs, and perceived health, controlling for demographic variables.

^b Multivariate associations between the three measures of SES and stress, health compromising behaviors, and perceived health, controlling for demographic variables.

* $p < .05$,

** $p < .01$,

*** $p < .001$.